In the Claims

Claims 1-38 are pending. Claims 2, 3, 9, and 11 are amended. Claims 26-38 are new.

1. (Previously Presented) A digital signal processing front end of a magnetic resonance imaging device, comprising:

a plurality of signal channels each having a respective amplifier with a respective gain, analog-to-digital converter (ADC), and digital down-converter interconnected such that a respectively amplified, digitized, and down-converted digital signal responsive to an analog resonance signal is generated;

a digital signal processor (DSP) connected to receive said digital signals and configured to select a one of said digital signals having a lowest distortion; and

said DSP being further configured to correct for lack of phase coherence and differing gain in said digital signals respective to each of said channels, whereby said one of said digital signals remains normalized with respect to others of said digital signals when said others are selected.

2. (Currently Amended) The ~~device~~ digital signal processing front end of claim 1, wherein at least some of said ADCs have respective overflow flags and said DSP is further configured such that it selects said one of said digital signals responsively to said overflow flags.

3. (Previously Presented) The ~~device~~ digital signal processing front end of claim 1, wherein said DSP is further configured such that said one of said digital signals is the

one corresponding to the one said respective amplifier with the highest of said respective gains that does not over-saturate an input of its respective ADC.

4. (Previously Presented) A receiver for a magnetic resonance imaging device, comprising:

amplifiers with respective gain factors and inputs connectable to a resonance signal source and respective outputs;

a respective analog-to-digital converter (ADC) connected to said respective output of each of said amplifiers, each said ADC having a respective digital output;

a digital signal processor (DSP) configured to select a one of said digital outputs for output to an imaging system such that quantization noise in said digital output is a minimum fraction of said digital output and such that the ADC corresponding to said one of said digital outputs is not over-ranged thereby; and

said DSP being further configured to correct for lack of phase coherence and differing gain in said digital outputs, whereby said one of said digital outputs remains normalized with respect to others of said digital outputs when said others are selected.

5. (Currently Amended) The receiver of claim 4, wherein said ~~digital signal processor~~ DSP is configured to select said one of said digital outputs responsively to a lookup table correlating maximum expected analog resonance signal levels with corresponding ones of said digital outputs to be selected.

6. (Previously Presented) The receiver of claim 5, wherein said maximum expected analog resonance signal levels each corresponds to a particular phase encoding level.

7. (Previously Presented) The receiver of claim 5, wherein said lookup table is configured to indicate a one of said digital outputs for selection which provides a highest gain factor such that amplification of said analog resonance signal does not over-saturate an input of a corresponding one of said ADCs.

8. (Currently Amended) The receiver of claim 4, wherein said ~~digital signal processor~~ DSP minimizes quantization error by selecting the digital output with the highest gain that does not cause saturation of an input of a corresponding one of said ADCs at any point of a single phase encoding level.

9. (Previously Presented) The receiver of claim ~~1~~ 11, wherein each digital down-converter comprises a multiplier.

10. (Previously Presented) The receiver of claim 9, wherein each digital down-converter further comprises a decimator to decimate an output of the multiplier.

11. (Currently Amended) The receiver of claim 4, further comprising at least one digital down-converter connected between said respective digital output and said ~~digital signal processor~~ DSP.

12. (Previously Presented) The receiver of claim 11, wherein the digital down-converter comprises a multiplier.

13. (Previously Presented) The receiver of claim 12, wherein the digital down-converter further comprises a decimator to decimate an output of the multiplier.

14. (Previously Presented) A method of digitizing an analog signal, comprising:

receiving the analog signal along a plurality of channels;

amplifying the signal along each channel with a respective gain;

converting each amplified signal into a digital signal, to provide a plurality of digital signals;

selecting a one of the digital signals having a lowest distortion; and

correcting for lack of phase coherence and differing gain in said digital signals respective to each of said channels, whereby one of said digital signals remains normalized with respect to others of said digital signals when said others are selected.

15. (Previously Presented) The method of claim 14, further comprising down-converting at least one of the digital signals prior to selection.

16. (Previously Presented) A magnetic resonance imaging system, comprising:

at least one magnetic field generator positioned to create a field through an imaging volume configured to receive at least a portion of a sample to be imaged;

at least one antenna to be positioned to apply an electromagnetic excitation to at least a portion of the sample within the imaging volume and to receive a magnetic resonance signal therefrom;

a plurality of signal channels coupled to the at least one antenna to receive the magnetic resonance signal, each of the plurality of signal channels comprising a respective amplifier with a respective gain, analog-to-digital converter (ADC), and digital down-converter interconnected such that a respective plurality of amplified, digitized, and down-converted digital signals responsive to the magnetic resonance signal are generated; and

a digital signal processor (DSP) connected to receive said digital signals and configured to select a one of said digital signals having a lowest distortion;

said DSP being further configured to correct for lack of phase coherence and differing gain in said digital signals respective to each of said channels, whereby said one of said digital signals remains normalized with respect to others of said digital signals when said others are selected.

17. (Previously Presented) The magnetic resonance imaging system of claim 16, wherein at least some of said signal channels comprise a respective ADC having a respective overflow flag and said DSP is further configured such that it selects said one of said digital signals responsively to each said overflow flag.

18. (Previously Presented) The magnetic resonance imaging system of claim 16, wherein said DSP is further configured such that said one of said digital signals is the

one corresponding to a respective amplifier with the highest respective gain that does not over-saturate an input of its respective ADC.

19. (Previously Presented) The magnetic resonance imaging system of claim 16, wherein each digital down-converter comprises a multiplier.

20. (Previously Presented) The magnetic resonance imaging system of claim 19, wherein the digital down-converter further comprises a decimator.

21. (Previously Presented) A method of conducting magnetic resonance imaging on a subject, comprising:

a) receiving a magnetic resonance signal from the subject along a plurality of channels;

b) amplifying the signal along each channel with a respective gain;

c) converting each signal along each channel into a digital signal, to provide a plurality of digital signals;

d) down-converting the digital signals;

e) selecting a one of the digital signals having a lowest distortion; and

f) correcting for lack of phase coherence and differing gain in said digital signals respective to each of said channels, whereby one of said digital signals remains normalized with respect to others of said digital signals when others are selected.

22. (Previously Presented) A method of digitizing an analog signal, comprising:

receiving the analog signal along a plurality of channels;

amplifying the signal along each channel with a respective gain;

converting each amplified signal into a digital signal with a respective analog-to-digital converter (ADC), to provide a plurality of digital signals;

selecting one respective digital signal such that quantization noise in said digital signal is a minimum fraction of said digital signal and such that an ADC corresponding to a selected digital signal is not over-ranged thereby; and

correcting for lack of phase coherence and differing gain in said digital signals respective to each of said channels, whereby said one of said digital signals remains normalized with respect to others of said digital signals when said others are selected.

23. (Previously Presented) A device for converting an analog signal to a digital signal, comprising:

amplifiers with respective gain factors and inputs connectable to a signal source and respective outputs;

respective analog-to-digital converters (ADCs) connected to said respective output of each of said amplifiers, each of said ADCs having a respective digital output;

a digital signal processor (DSP) connected to each respective digital output, the digital signal processor configured to select one respective digital output for output to an imaging system such that quantization noise in said digital output is a minimum fraction of said digital

output and such that an ADC corresponding to a selected digital output is not over-ranged thereby; and

said DSP being further configured to correct for lack of phase coherence and differing gain in said digital outputs, whereby said one of said digital outputs remains normalized with respect to others of said digital outputs when said others are selected.

24. (Previously Presented) A magnetic resonance imaging system, comprising:

at least one magnetic field generator positioned to create a field through an imaging volume configured to receive at least a portion of a sample to be imaged;

at least one antenna to be positioned to apply an electromagnetic excitation to at least a portion of the sample within the imaging volume and to receive magnetic resonance signals therefrom;

a plurality of amplifiers having respective gain factors, the amplifiers comprising respective inputs coupled to the antenna to receive magnetic resonance signals and respective outputs;

a respective plurality of analog-to-digital converters (ADCs) connected to said respective outputs of said amplifiers, each of said ADCs having a respective digital output;

a digital signal processor (DSP) connected to each respective digital output, the digital signal processor configured to select one respective digital output such that quantization noise in said digital output is a minimum fraction of said digital signal and such that an ADC corresponding to a selected digital output is not over-ranged thereby; and

said DSP being further configured to correct for lack of phase coherence and differing gain in said digital outputs, whereby said one of said digital outputs remains normalized with respect to others of said digital outputs when said others are selected.

25. (Previously Presented) A receiver for a magnetic resonance imaging device, comprising:

amplifiers with respective gain factors and inputs connectable to a resonance signal source and respective outputs;

a respective analog-to-digital converter (ADC) connected to said respective output of each of said amplifiers, each said ADC having a respective digital output;

a digital signal processor (DSP) configured to select a one of said digital outputs for output to an imaging system such that quantization noise in said digital output is a minimum fraction of said digital output and such that the ADC corresponding to said one of said digital outputs is not over-ranged thereby; and

said DSP being further configured to select said one of said digital outputs responsively to a lookup table correlating maximum expected analog resonance signal levels with corresponding ones of said digital outputs to be selected.

26. (New) A magnetic resonance imaging system comprising:

a plurality of signal channels to receive a magnetic resonance signal, each of the plurality of signal channels comprising a respective amplifier with a respective gain, analog-to-digital converter (ADC), and digital down-converter interconnected such that a respective

plurality of amplified, digitized, and down-converted digital signals responsive to the magnetic resonance signal are generated; and

a digital signal processor (DSP) connected to receive said digital signals and configured to select a one of said digital signals having a lowest distortion;

said DSP being further configured to correct for lack of phase coherence and differing gain in said digital signals respective to each of said channels, whereby said one of said digital signals remains normalized with respect to others of said digital signals when said others are selected.

27. (New) The method of claim 21, further comprising:

repeating a) – f) for a plurality of magnetic resonance signals received from the subject; and

reconstructing a magnetic resonance image of at least a portion of the subject based on the selected and corrected digital signals.

28. (New) The method of claim 27, comprising:

down-converting each of the plurality of digital signals to provide a plurality of down-converted digital signals;

selecting a one of the down-converted digital signals having a lowest distortion; and

correcting for lack of phase coherence and differing gain in said down-converted digital signal respective to one of said channels, whereby one of said digital signals remains normalized with respect to others of said digital signals when others are selected.

29. (New) The device of claim 23, further comprising at least one digital down-converter connected between said respective digital output and said digital signal processor.

30. (New) The device of claim 29, wherein the digital down-converter comprises a multiplier.

31. (New) The device of claim 30, wherein the digital down-converter further comprises a decimator to decimate an output of the multiplier.

32. (New) The magnetic resonance imaging system of claim 24, wherein said digital signal processor is configured to select said one respective digital output responsively to a lookup table correlating maximum expected analog resonance signal levels with a corresponding digital output to be selected.

33. (New) The magnetic resonance imaging system of claim 32, wherein said maximum expected analog resonance signal levels each correspond to a particular phase encoding level.

34. (New) The magnetic resonance imaging system of claim 32, wherein said lookup table is configured to indicate a digital output for selection which provides a highest gain factor such that amplification of said analog resonance signal does not over-saturate an input of a corresponding ADC.

35. (New) The magnetic resonance imaging system of claim 24, wherein said digital signal processor minimizes quantization error by selecting the digital signal with the highest gain that does not cause saturation of an input of a corresponding ADC at any point of a single phase encoding level.

36. (New) The magnetic resonance imaging system of claim 24, further comprising at least one digital down-converter connected between said respective digital output and said digital signal processor.

37. (New) The magnetic resonance imaging system of claim 36, wherein the digital down-converter comprises a multiplier.

38. (New) The magnetic resonance imaging system of claim 37, wherein the digital down-converter further comprises a decimator to decimate an output of the multiplier.